

## **Mowing**

### **1994**

Most plantings were mowed once or twice during the growing season to reduce weedy competition and to provide light to developing prairie species. We also baled a cover crop of oats to remove non-native plant material and expose developing prairie species to sunlight.

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### **1995**

In some three-year-old plantings mowing was used to limit success of particular weed problems on the site. Site 17, for example, supported heavy populations of sweet clover. This biennial exotic species can be a severe problem in prairie plantings. This site was mowed twice at peak blooming and prior to seed set to reduce reproductive success of the sweet clover. Interestingly, a good stand of prairie dominated by little bluestem matured and was harvested despite repeated mowing.

By the end of fall, 8 sites planted in 1993 and totaling approximately 190 acres completed their third growing season. Despite sparse evidence of establishment and growth in 1993 and 1994, prairie species began to thrive this year. All sites with the exception of one produced seed of at least one prairie species to make harvest worthwhile. Additional harvest sites included a 1994 planting site and a small remnant site and a small remnant population of Indian grass.

Harvest resulted in 950 lbs. of big bluestem, 450 lbs. of Canada wild rye, 300 lbs. of little bluestem, 20 lbs. of little bluestem, 300 lbs. of forbs/grass mixture and 45 lbs. of partridge pea. The mix of prairie forbs and grass species was dominated by Virginia wild rye, Canada wild rye, drooping coneflower, mountain mint, black-eyed Susan, and wild bergamot. These weights represent bulk, partially cleaned harvest and are estimated to be approximately 50% pure seed.

In addition to vigorous growth, marked increase in biomass and ultimate seed production, plant species establishment patterns on these sites are interesting in comparison to one another. On most sites, the most visually dominant species are prairie grass species, especially big bluestem. Within a matrix of grass species, a diversity of forbs is present. Asters, goldenrods, black-eyed Susan, evening primrose, tick trefoil, mountain mint, and several other species are common species present in the matrix of dominant grass. Other species such as compass plant, purple prairie clover, white prairie clover, blue flag iris, pale purple coneflower and others are present but in relatively low numbers.

These observations may be deceiving or premature, however, as most of these sites were mowed once or twice in 1995 to accomplish weed control. Though grass species tended to grow vigorously by the end of the season, many forb species tended not to achieve their typical height, and most did not bloom. Long-lived perennials producing only basal

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leaves at this state, such as pale purple coneflower and compass plant, might not produce additional leaves. Other forb species lost apical dominance with mowing and branched, completing the season at a lower height than their counterparts in unmowed areas. We are taking a “wait-and-see” attitude toward forb establishment in these areas, especially as many species of forbs have a longer establishment time relative to flowering than do grass species.

Haying – During the 1995 season haying took place on 20 acres of tame hay, mostly brome. This parcel was a new acquisition that the previous owner had used for hay in the past. In the future haying will be handled on a case-by-case basis.

Pest control took a great deal of the Operation Staff’s time during the summer and early fall of 1995. Mowing occurred on 2,200 acres to assist in controlling undesired weeds, thistle, and invading brush. These acres were, for the most part, planted to native species or edges of remnant tracts, and former CRP acres. On the land planted to native species, we mowed to accomplish two things; to control undesirable weed species so the light would penetrate to the young native plants, and secondly to control thistles. All other mowing was performed as a control to measure to prevent thistle, sweet clover, and mares tail from going to seed.

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## **1996/7**

Pest control continues to take a major portion of the Operations Staff’s time during the summer and early fall months. Mowing to control weeds, thistle, and undesired brush took place on approximately 2,000 acres. This continues to be a part of the management strategy for new plantings.

Chemical control was done on 585 acres by Refuge staff. This treatment was done to control brush resprout, using Garlon 4 and burn down prior to planting of native species, using 2-4D and Roundup.

In 1995 we reported the use of Roundup in a late fall application to control Reed Canary, Brome, and Switch grasses. It appears that a properly timed late fall application does indeed have controlling effects on these species. More work will be done to document this control method.

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## **1998**

Pest control took a great deal of Operation Staff’s time during the summer and fall of 1998. Mowing occurred on 2,500 acres to assist in controlling undesired weeds, thistle, and invading brush. These acres were, for the most part, planted to native species or edges of remnant tracts, and former CRP acres. On the land planted to native species, we

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mowed to accomplish two things – to control undesirable weed species so the light would penetrate to the young native plants, and secondly to control thistles. All other mowing was performed as a control measure to prevent thistle, sweet clover, and mares tail from going to seed. Herbicides also played a role in pest control. Approximately 690 acres were sprayed with Round-up and 2,4-D or Transline, all used as either a pre-plant burn down and as a control measure for thistle and other undesirable weed species. Also, Garlon 4 was used on stumps to prevent woody re-growth (18 gallons at approximately 2.5 acres).

There were no major weed or insect problems relating to the farming program. Very wet spring weather delayed planting but otherwise crop production on the Refuge was as good as or slightly higher than on neighboring areas.

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### **1999**

There is no grazing or haying to report. However, mowing plays an integral part at Neal Smith NWR. Mowing takes place as a first and second year management tool on new prairie plantings. Also, mowing is used to control broadleaf weeds and woody vegetation to promote native growth. Approximately 1,000 total acres were mowed in FY99, consisting of prairie plantings, firebreaks, demolition sites, and weed management sites.

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### **2000**

Mowing is an integral part of prairie reconstruction at the Refuge. Mowing takes place as a first and second year management tool on new prairie plantings. Also, mowing is used to control broadleaf weeds and woody vegetation to promote native growth. Approximately 600 total acres were mowed in FY00, consisting of prairie plantings, firebreaks, demolition sites and weed management sites.

Canada thistle is a problem throughout the Refuge and is treated using TransLine. Strategies to eliminate this problem species are being explored by the Refuge biologist. Reed canary grass is a problem in dry creek bottoms and will be treated with well timed mowing and spraying sequences using RoundUp.

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### **2001**

Mowing is an integral part of prairie reconstruction at Neal Smith NWR. Mowing takes place as a first and second year management tool on new prairie plantings, and is used to control broadleaf weeds and woody vegetation to promote native growth. Approximately 840 total acres were mowed in FY01, consisting of prairie plantings, firebreaks,

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demolition sites and weed management sites. Several of these areas were mowed more than once.

Canada thistle is a problem throughout the Refuge and is treated using TransLine and early mowing. Strategies to eliminate this problem species are being explored by the Refuge Biologist. Reed canary grass is a problem in dry creek bottoms and will be treated with well timed mowing and spraying sequences using Round-Up. Approximately 300 acres of invasive plants were controlled during FY 2001.

**Volunteer Program** - Volunteers at the Neal Smith National Wildlife Refuge-Prairie Learning Center are continuing to be a useful tool in restoring the tallgrass prairie and helping with environmental education and special events. Volunteers contributed 16,389 hours to the Refuge this past year. As one of the largest tallgrass prairie reconstruction projects in the United States, our volunteers donated 6,912 hours working on upland restoration, 728 volunteers hours helping with mowing and pest plant control, 6,788 hours providing visitor services and outreach and 1,961 hours with Surveys, Censuses and Investigations.

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## 2002

Conversion of a reed canary grass (*Phalaris arundinacea*) dominated area to a diverse sedge meadow began in an area north of Thorn Valley Savanna, and bounded on the northeast by Walnut Creek. A first step began last year with installation of a plant transect using the Floristic Quality Assessment Technique (Swink and Wilhelm, 1994) in this area, and in a similar area across the stream to the northeast. This low wet area of reed canary grass was nearly exclusive of other species. In 2001, several well nests were also installed on each side of the stream (see 1.b. Studies and Investigations). This will allow staff to begin to develop an understanding of the relationship of vegetation and hydrology.

In 2002, the area was mowed when blooming, followed by treatment with glyphosate in mid-summer to stress or kill reed canary grass. Results were good in the centrally located treatment area; most of the vegetation dried up and actually blew away. Additional treatment of the perimeter identified as part of the study area was not possible because standing or downed trees prevented use of motorized equipment. However, water level data in nested wells bisecting the treated area indicated that the water level was three feet higher here relative to the control side. This difference was attributed to a considerably diminished transpiration ability on the treated area.

Patches of reed canary grass still occur, and a flush of germination of reed canary grass is expected in the spring. A follow-up treatment will be necessary. Woody species inhibit this work.

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In anticipation of spring 2003 planting, plugs of prairie cord grass (*Spartina pectinata*) and a couple of sedge species have been propagated in Refuge greenhouses. A thousand containers of approximately 25 species of forbs suitable for wetlands have been reserved for planting. Arrangements have been made with the Polk County Conservation Board for taking samples of several conservative species of sedge from Engeldinger Marsh, a high quality prairie pothole in the adjacent county to the west, for spring propagation and later planting.

Mowing is an integral part of prairie re-construction at Neal Smith NWR. Mowing takes place as a first and second year management tool on new prairie plantings. Also, mowing is used to control broadleaf weeds and woody vegetation to promote native growth. Approximately 816 acres were mowed in FY02, consisting of prairie plantings, firebreaks, demolition sites and weed management sites.

Maintenance Mechanic Boot used the hydra-axe during FY01 and the beginning of FY02. He was able to clear approximately 25 acres of trees during FY02.

Canada thistle is a problem throughout the Refuge and is treated using TransLine and early mowing. Strategies to eliminate this problem species are being explored by the Refuge biologist. Reed canary grass is a problem in dry creek bottoms and is treated with well timed mowing and spraying sequences using RoundUp. Other target species included sweet clover, musk thistle and black locust, yellow and white sweet clover, crown vetch and *Rubus parvifolius* (no common name available).

Charland and teams including interns and volunteers have worked valiantly to eliminate black locust on two sites on the Refuge, one near Thorn Valley Savanna, the second on the south side of Planting Site 23. Garlon and RoundUp were used and both resulted in varying degrees of success.

*Rubus parvifolius* is a member of the raspberry family, is relatively new and does not show up in most botanical keys. In Iowa, it was distributed by the DNR State Forest Nursery in Ames in the 1960's for conservation purposes. On NSM, it thrives in partial shade as a decumbent vine with pink flowers. Charland and interns have focused on killing a population that has become alarmingly extensive in one savanna. Much progress in controlling this species has been made using RoundUp, though vigilance is necessary to totally eliminate this difficult-to-manage species.

Pesticide records are maintained on the Refuge to document the amount and type of chemical used within each planting site or other management area. Sixty-one gallons of chemical were used this year including RoundUp, Rodeo, 2,4-D, Garlon 3A and Transline. A volunteer, Elmer Blythe, entered the years of data onto a database. Bio Tech Charland also created a database that was later adopted as the master with the information that Blythe created merged into it.

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### **2003**

S. Van Ryswyk, Van Zee and Boot mowed and sprayed Canada and musk thistle on 120 acres and mowed and spot sprayed 20 miles of roadside and fire breaks. They removed approximately one mile of fence. Boot also filled two abandoned wells on the refuge.

Biology staff and interns, SCA, range techs, and Operations staff followed up a 14 acre burn immediately southwest of the Prairie Learning Center with a re-vegetation project. Drobney developed a species rich seed mix and Krueger and additional biology staff mixed seed for the area. Van Zee machine mowed and planted the area where possible, while biology staff members hand seeded the steeper slopes and areas inaccessible by machine. A total of 258 pounds of seed mix was planted within the site. One thousand plants were hand planted from containers in areas highly visible from the entry road. Soil was wet when planted and significant rains fell soon after which provided for good conditions for plant establishment.

SCA, Range Techs and Krueger continued to fight the battle against the reed canary grass within the sedge meadow. Crews used weed eaters and brush mowers to knock down the grass, while others treated the newly cut grass with Rodeo herbicide.

Mowing is an integral part of prairie reconstruction at Neal Smith NWR. Mowing takes place as a first and second year management tool on new prairie plantings. Also, mowing is used to control broadleaf weeds and woody vegetation to promote native growth. Approximately 816 acres were mowed in FY03, consisting of prairie plantings, firebreaks, demolition sites and weed management sites.

Non-native switchgrass has also been a challenge for us. This year we utilized a variety of techniques to help control and try to prevent its spread. In late spring, with the help of interns, we used brush cutters on weed eaters to mow down all of the switchgrass we could identify around the Prairie Learning Center and adjoining parking areas. With the aid of the SCA crew, we then returned and treated the clumps with Plateau herbicide using backpack and hand sprayers for application. We also used this method of treatment on our Coneflower Unit where switchgrass is not as prevalent yet still unwanted. Later in the summer when the switchgrass was flowering and forming seed heads, we located these plants around the Learning Center and the Coneflower Unit and clipped off the heads and disposed of them in the garbage. Plants were then treated with Plateau. Switchgrass continued to form seed heads throughout the summer, so we were constantly finding new plants in areas we had already treated. We will be treating switchgrass again next year, we are certain of that, we hope though that we were able to knock it back and help to prevent its spread.

We currently have reed canary grass growing in various places throughout the refuge. One of the places we focused our attention on heavily this year was our sedge meadow reconstruction area. The SCA crew, along with refuge staff, began by cutting the reed canary grass with mowers and brush cutters to first knock it down for easier access and treatment. We then returned to the area and used backpack sprayers to apply Rodeo

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herbicide due to the moistness of the area. Later in the summer, we treated the area a second time with the use of a Polaris Ranger with a thirty gallon tank and wand sprayer. The cutting and chemical treatments seemed to have knocked the grass down and slowed its advance for the time being. A burn plan has been written for the spring of 2004, this would additionally aid in the control of the grass by burning off new shoots and further stressing established plants.

This year for the first time, *Sericea lespedeza* was identified on the refuge. This plant was formerly used for pastures and along roadsides, however, in Iowa it is classified as a noxious invader. It spreads rapidly and consumes areas if left untreated and chokes out local native vegetation. It is fire tolerant and is not killed by chemical application, simply prevented from flowering. Once we positively identified the plant in the three small patches on the refuge, we applied Round-up on each site prior to flowering. The plants appeared to be stressed by the chemical and did not achieve flowering or seed production; however, the plants did not appear to have been eliminated.

The control of Canada thistle was performed by mowing and moderate chemical treatment. Isolated patches of thistle were identified throughout the refuge; these patches were then mowed, along with a radius around them to prevent the spread. Areas that were disturbed by machinery where thistles had come up were treated with chemicals.

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## 2004

The Refuge had a very active year in the area of upland restoration, from shearing and removing trees to picking and cleaning seed. Brian Boot, Maintenance Mechanic, spent a great deal of time operating equipment to prepare areas for seeding, spending several days shredding trees on the Birkenholtz site for converting cropland to prairie. Brian was also able to prepare three additional sites, Cabbage, Curry and Kane, for seeding and grading by mowing fence rows, shredding trees and removing trash and metal posts.

Operations staff worked diligently in May to mow and maintain the 500 acres of cropland planted to prairie last year. They continued to mow to control thistle and enhance the growth of the native vegetation. Native plants started to take a strong hold in these areas and Operations did an excellent job handling the daunting task of mowing 500 acres.

Mowing is an integral part of prairie reconstruction at Neal Smith NWR. Mowing takes place as a first and second year management tool on new prairie plantings. Also, mowing is used to control broadleaf weeds and woody vegetation to promote native growth. Approximately 1,840 total acres were mowed in FY04, consisting of prairie plantings, firebreaks, demolition sites and weed management sites.

They (volunteers) dedicated 400 hours to mowing and an additional 400 hours went to helping with fire activities. Volunteers also helped with studies and investigations for another 400 hours. This year, 228 volunteers worked at least once with 23 volunteers

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each putting in over 200 hours. Two big events helped bring in a large number of volunteers and groups. Al Murray led two large stewardship days, “Ding” Darling Day in October and Earth Day in April. Both events had close to 200 volunteers, each providing approximately four hours each. Al, with the help of staff and other volunteers, pulled out fence, cleaned the road ditches, cut out unwanted brush and collected and cleaned seeds.

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### **2005**

June 2005

Hager mowed over 80 patches of Canada thistle totaling approximately 40 acres. Sites were marked by GPS to allow over seeding with prairie species forbs and grass.

Thistle and sweet clover are the issues of the month. Mowing and interseeding with native seed is the treatment. Canada thistle and sweet clover were mowed. Musk thistle and sweet clover and queen anne’s lace were pulled by hand.

July 2005

Operations and Biology staff completed seeding around thistle plots, and continued mowing as allowed by weather and repairs. Boot repaired mowers, tractors, vehicles, and visitor center displays. STEP Bruns seeded and mowed. Hager mowed thistles followed by Intern Farnsworth seeding the areas. Fire Tech Hollerich took 3 dump truck loads of metal debris to recycling center and one load of other to the land fill.

Canada thistle was mowed and areas interseeded on approximately 100 acres.

August 2005

Boot, Bruns, and Hager mowed fire breaks and plantings.

Hager mowed thistle patches and Bruns overseeded.

September 2005

Thistle suppression: Plots are being mowed periodically as needed by refuge operations staff. Side oats grama in prairie reconstruction: Ryan Welsh, UNI, continues work with side oats grama and native diversity project, including sampling vegetation and mowing.

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### **2006**



## Mowing

May 2006

Intern Costello finished cleaning out dead plant stock in the production greenhouse, and continued maintenance and care of the plants there. Krueger and Costello continued repair and maintenance on the irrigation system for the production plots. By the end of the month the system was up and running. Krueger mowed around the plots to control weeds.

June 2006

Boot, Bruns, Krueger, Hager, and Allen mowed and sprayed herbicide to control several invasive plants including white and yellow sweet clover, crown vetch, musk thistle, Canada thistle, *Rubus parvifolius* and *sericea lespedeza* for a total of about 100 acres mowed and 100 acres sprayed.

July 2006

Boot also mowed 12 miles of fire breaks around all units while Bruns seeded the areas of last year's tree clearing (~40 acres) and inter-seeded areas mowed for weed control (128 areas ranging in size from <1/4 acre to over 5 acres).

It was a particularly good year for certain invasive species on the Refuge. Krueger spot-sprayed patches of invasive plants with herbicide this month. The particularly nasty *Sericea lespedeza* was treated in the Ant Mound unit and along the entry road, and *Rubus parvifolius* was treated at the Savanna Reconstruction site. Muerdter and Mills monitored part of the entry road for *Sericea lespedeza* and did not locate any. Muerdter and Mills pulled and mowed white sweet clover at Coneflower Prairie. Viste-Sparkman, Mills, and a group of students from DMACC pulled white sweet clover in the Butterfly Hill Unit. Mills continued to spend most of her time researching invasive species biology and control methods. Boot, Hager and Bruns continued invasive weed control by mowing and spraying herbicide. Most of the problems were musk and Canada thistle, *lespedeza cuneata*, and sweet clover.

Hager sprayed a test of Krennite on sumac trees at Coneflower Prairie. The sumac were burned in the fall and mowed in the spring. Hopefully, the final treatment of pesticide will provide the control desired. No single treatment has been successful to date. A test spray of Plateau was attempted to control Queen Ann's Lace on the shoulder of the entry road and along trails. Hager also sprayed the recently constructed pull offs for the auto tour route, the cattle guard crossings, the maintenance yard and the wetland berms with glyphosate.

Hager and Allen mowed, posted signs and information boxes at all hunter parking areas.

Hager and Allen also surveyed and posted boundary signs along the borders of Coneflower and North Middle Units.

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September 2006

Krueger, Hager, and Viste-Sparkman continued to find more new locations for sericea lespedeza (*Lespedeza cuneata*). Coneflower, Ant Mound, Basswood, Deer Valley, North and South Bison Units, Cabbage, Highpoint and the Henslow Hill roadside are all known to have infestations. Krueger and Hager spot-sprayed some patches, while others will be mowed to prevent seed set. Locations of all known populations are being recorded with GPS. We plan on treating it aggressively earlier in the season next year now that we have the locations known. This plant has increased 10 fold in the last year. Our first encounter was in 2004 with one known population.

Hager mowed 80 acres inside the bison enclosure to facilitate new growth on cool season grasses for forage.

October 2006

Hager located, GPS'd, and mowed or treated several areas containing *Lespedeza cuneata*. He also researched several chemical treatment options for testing next year. A huge effort will be needed next year to control the spread of this invasive species. Viste-Sparkman contacted Tim Menard at Flint Hills NWR and discussed control techniques for *Lespedeza cuneata*. They have had some success in controlling it and Tim was optimistic that with persistence we could win the battle. Hager, Krueger and Murray attended pesticide training to maintain their state issued pesticide applicator licenses.

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## **2007**

May 2007

'Tis the season of mowing. Operations staff has begun to mow new plantings, areas of resprouting trees, as well as Canada thistle and sweet clover sites. Staff started looking for *Lespedeza cuneata*, GPS'ing its location so it can be tracked, and treating plants. Also, several hundred tree stumps were treated with Garlon to prevent them from resprouting. Krueger used the excavator to remove trees from Walnut Creek during an Eagle Scout project so the trees could be bucked up and piled for burning.

June 2007

Bruns, Boot and Krueger have been all over the refuge mowing white and yellow sweet clover as well as thistle in an effort to prevent it from spreading and forming dense patches.

July 2007

Boot, Krueger, and Bruns mowed new plantings for the second time this year.

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Several hundred acres of sweet clover were mowed.

August 2007

Boot and Krueger were busy with mowing sweet clover and fire breaks. Boot worked on equipment repairs and getting bids for new equipment.

July 2008

Krueger started mowing fire breaks for the fall burn season.

Krueger, Boot and Debruin continued to mow large patches of white sweet clover in attempt to prevent it from going to seed and spreading.

July 2009

Boot and Debruin filled 4 more wells. Boot graveled a portion of the tour loop. DeBruin, Boot, and Kane mowed the 100 acre new plantings. Debruin made several trips to the landfill to dump debris.

Boot, Debruin, and Kane mowed and/or sprayed sweet clover and Canada thistle on several hundred acres.